

## System for the Analysis of Global Energy Markets (SAGE)

The projections of world energy consumption appearing in this year's *International Energy Outlook (IEO)* are based on the Energy Information Administration's (EIA's) new international energy modeling tool, System for the Analysis of Global Energy markets (SAGE). SAGE is an integrated set of regional models that provide a technology-rich basis for estimating regional energy consumption. For each region, reference case estimates of 42 end-use energy service demands (e.g., car, commercial truck, and heavy truck road travel; residential lighting; steam heat requirements in the paper industry) are developed on the basis of economic and demographic projections. Projections of energy consumption to meet the energy demands are estimated on the basis of each region's existing energy use patterns, the existing stock of energy-using equipment, and the characteristics of available new technologies, as well as new sources of primary energy supply.

Period-by-period market simulations aim to provide each region's energy services at minimum cost by simultaneously making end-use equipment and primary energy supply decisions. For example, in SAGE, if there is an increase in residential lighting energy service, either existing generation equipment must be used more intensively or new equipment must be installed. The choice of generation equipment (type and fuel) incorporates analysis of both the characteristics of alternative generation technologies and the economics of primary energy supply.

Although the modeling system used to develop the projections has changed, this year's *IEO* maintains the same level of fuel detail and the same tabular format. As in the past, the *IEO* provides projections of total world primary energy consumption, as well as projections of energy consumption by primary energy type (oil, natural gas, coal, nuclear, and hydroelectric and other renewable resources) and projections of net electricity consumption. Projections of carbon dioxide emissions resulting from fossil fuel use are also provided. All projections are computed in 5-year intervals through the year 2025. Further, more detailed tables that emphasize the end-use demand-driven nature of SAGE will be considered for future reports.

SAGE projections are provided for regions and selected countries. Projections are made for 14 individual

countries, 9 of which—United States, Canada, Mexico, Japan, United Kingdom, France, Germany, Italy, and Netherlands—are part of the designation “industrialized countries.” Individual country projections are also made for China, India, South Korea, Turkey, and Brazil, all of which are considered “developing countries.” Beyond those individual countries, the rest of the world is divided into regions. Industrialized regions include North America (Canada, Mexico, and the United States), Western Europe (United Kingdom, France, Germany, Italy, Netherlands, and Other Europe), and Pacific (Japan and Australia/New Zealand). Developing regions include developing Asia (China, India, South Korea, and Other Asia), Middle East (Turkey and Other Middle East), Africa, and Central and South America (Brazil and Other Central and South America). The “transitional economies,” consisting of the countries in Eastern Europe (EE) and the former Soviet Union (FSU), are considered as a separate country grouping, neither industrialized nor developing.

Projections of world oil prices over the forecast horizon are provided to SAGE from EIA's International Energy Module, which is a submodule of the National Energy Modeling System (NEMS). Projections of world nuclear energy consumption are derived from nuclear power electricity generation projections from EIA's International Nuclear Model (INM), PC Version (PC-INM). All U.S. projections are taken from EIA's *Annual Energy Outlook (AEO)*.

A full description of SAGE is forthcoming in a three-volume set. The first volume will provide a general understanding of the model's design, theoretical basis, necessary user-defined assumptions, and output. It will also list the software necessary to develop and analyze the results of SAGE-based policy and energy market scenarios and provide vendor contact information. The second volume, a Reference Guide, will explain each equation in detail, and a third volume will serve as a User's Guide for those actively developing SAGE-based scenario analyses. The documentation will be available on EIA's web site in the summer of 2003. Also available for downloading at that time will be the regional assumptions used to develop the *IEO2003* projections. The format of the assumptions will follow the instructions appearing in the User's Guide.